

REMARKS

This Amendment is in response to the Office Action mailed on September 16, 2004.

In the Office Action, the Examiner:

- objected to the disclosure because of a typographic error;
- objected to the drawings for not showing every feature in some of the claims;
- rejected claims 1, 11, 23, and 28 under 35 U.S.C. 112, first paragraph, for failing to comply with the enablement requirement;
- rejected claims 2-10, 12-20, 22-29, 31, and 41-48 under 35 U.S.C. 112, first paragraph, for failing to comply with the enablement requirement because they depend from the above rejected base claims;
- rejected claims 1-9 under 35 U.S.C. 102(b) as being unpatentable by Johnson (US 5,059,916);
- rejected claim 1 under 35 U.S.C. 103(a) as being unpatentable over Audy (US 6,246,243 B1)); and
- rejected claim 10 under 35 U.S.C. 103(a) as being unpatentable over Johnson in view of Ozguc (US 6,130,541).

In this response, the specification has been amended to correct the typographic error involving a reference numeral, claims 1-4 and 7-22 have been cancelled, claims 5-6, 23-24, 28-29, 31, and 41-48 have been amended, and new claims 49-69 have been added.

Reconsideration of the rejected claims and examination of the new claims are requested.

The objection to the drawings should be withdrawn in light of the claim amendment as all of the features in the current list of claims are believed to have been shown in the drawings.

Claim 5 is amended to be in independent form. As amended, claim 5 now recites:

An apparatus for determining a state of a measurable circuit element having a plurality of states and a different impedance in each state, comprising:

a replicate circuit having a replicate circuit element and configured to generate a first test current through the replicate circuit element, the replicate circuit element having similar electrical characteristics as the measurable circuit element; and

a trim determination circuit coupled with the replicate circuit, the trim determination circuit including the measurable circuit element and configured to generate a second test current dependent on the first test current through the measurable circuit element, the trim determination circuit further including a scaled reference current source for generating a scaled reference current and a dependent measurable current source coupled with the scaled reference current source for generating a measured current whereby the amount of the measured current is a function of a first voltage drop across the measurable circuit element and the state of the measurable circuit element is determined by the difference between the scaled reference current and the measured current.

Claim 5 as amended is distinguishable from Johnson because Johnson does not disclose a scaled reference current source for generating a scaled reference current. In rejecting claim 5 as previously presented, the Examiner has regarded the offset voltage 17 in Johnson as the scaled reference current in the claim. But the offset voltage 17 is not a current source and it does not generate a scaled reference current. In fact, the offset voltage 17 is not even a circuit element. It merely "represents the difference in potential that exists between the gas tank and the dashboard." (Col. 1, lines 37-39) Therefore, the offset voltage 17 in Johnson cannot be analogized with the scaled reference current source in amended claim 5, and Johnson does not disclose the scaled reference current source in amended claim 5.

Claim 5 as amended is further distinguishable from Johnson because Johnson does not disclose a dependent measurable current source coupled with the scaled reference current source for generating a measured current whereby the amount of the measured current is a function of a voltage drop across the measurable circuit element. In rejecting claim 5 as previously presented, the Examiner regarded transistor 36 in Johnson as the dependent measurable current source. This is incorrect because transistor 36 in Johnson does not generate a measured current that is a function of a voltage drop across the sense resistor 14, which the Examiner regarded as the measurable circuit element. In Johnson, transistor 36 acts as part of a current mirror and the current generated by transistor 36 is a

mere multiple of the current through transistor 35, which current is dependent on the variable resistor 33 and not on the sense resistor 14 or the voltage across the sense resistor 14 (Col. 3, lines 50-58). Therefore, transistor 36 in Johnson cannot be analogized with the dependent measurable current source in amended claim 5, and Johnson does not disclose the dependent measurable current source in amended claim 5.

Claim 5 as amended is further distinguishable from Johnson because Johnson also does not disclose a trim determination circuit wherein the scaled reference current source and the dependent measurable current source are coupled with the measurable circuit element such that the state of the measurable circuit element is determined by the difference between the scaled reference current and the measured current. In Johnson, due to the action of oscillator 25, the current through sense resistor 14 will be pulsating (Col. 3, lines 60-61). “The pulsating voltage developed across sense resistor 14 is coupled by way of capacitor 23 and resistor 37 to the inverting input of op-amp 38.” (Col. 3, lines 61-64) A detector is configured to respond to variations in the pulsating potential thereby produces an output proportional to the variations in the pulsating current through sense resistor 14 (Claim 1). Thus, in Johnson, the state of sense resistor 14 is determined by variations in the pulsating current through the sense resistor 14 and not by the difference between currents generated by two different current sources.

Therefore, claim 5 as amended is patentable over Johnson.

Claim 6 as amended and claims 41-43 as amended depend from claim 5 as amended and include further limitations in addition to the limitations in claim 5 as amended. Accordingly, Claim 6 as amended and claims 41-43 as amended are patentable for at least the same reasons claim 5 as amended is patentable.

Claim 6 as amended is patentable for the further reason that Johnson does not disclose a replicate circuit including an adjustable current source, a threshold current source and a reference current source. The part of the circuit (35, 34, 32, 33) in Johnson, which the Examiner regarded as the replicate circuit in rejecting claim 1, only includes transistor 32 as a current source. The function of the diode-connected transistor 35 is not to generate a current but to mirror the current generated by the transistor 32 (Col. 3, lines 50-55). Thus,

Johnson does not disclose three different current sources in the replicate circuit as claimed in the amended claim 6.

Claim 6 as amended is patentable for the further reason that Johnson does not disclose three different current sources acting together in the replicate circuit so that the current generated by one of the current sources (the adjustable test current source) is stabilized when the difference between the currents generated by the other two current sources (the dependent threshold current source and the reference current source) is zero, as claimed in amended claim 6.

Claim 41 as amended is patentable for the further reason that Johnson does not disclose a reference current source or a scaled reference current source (as discussed above) or that the scaled reference current is scaled from the reference current.

Claim 42 as amended is patentable for the further reason that Johnson does not disclose a measurable circuit element being a Zener diode having a trimmed and untrimmed state.

Claim 43 as amended is patentable for the further reason that Johnson does not disclose a replicate circuit element being an untrimmed Zener diode.

Therefore, claim 6 as amended and claims 41-43 as amended are patentable over Johnson.

Claim 23 as previously presented was rejected under 35 U.S.C. 112, first paragraph, for failing to comply with the enablement requirement because of the recitation of a “comparison between the second voltage drop and the first voltage drop.” The claim has been amended to remove the recitation. The amendment is supported by FIG. 3 and Pages 9-12 of the specification. Therefore, the rejection of claim 23 and the claims dependent therefrom under 35 U.S.C. 112, first paragraph, should be withdrawn.

The argument regarding claim 5 as amended applies to claim 23 as amended. Therefore, claim 23 is assumed to be patentable over Johnson.

Claim 24 as amended, claims 25-27, and claims 44-45 as amended depend from claim 23 as amended and include further limitations in addition to the limitations in claim

23 as amended. Accordingly, claim 24 as amended, claims 25-27, and claims 44-45 as amended are patentable for at least the same reasons claim 23 as amended is patentable.

Claim 28 as previously presented was rejected under 35 U.S.C. 112, first paragraph, for failing to comply with the enablement requirement because of the recitation of a “comparison between the first sense voltage and the measured voltage.” The claim has been amended to remove the recitation. The amendment is supported by FIG. 4 and Pages 12-14 of the specification. Therefore, the rejection of claim 28 and the claims dependent therefrom under 35 U.S.C. 112, first paragraph, should be withdrawn.

Claim 28 as amended recites:

An apparatus for improving the accuracy of a circuit, comprising a measurable circuit element having a plurality of states with a different impedance in each state whereby a test current received by the measurable circuit element results in a first voltage drop across the measurable element, a first amplifier having first and second inputs, the measurable element being coupled with the first input of the first amplifier for providing the first input with a measured voltage dependent on the first voltage drop, and a first sense voltage being supplied to the second input of the first amplifier, the first amplifier being configured to generate a first amplifier output dependent on the difference between the measured voltage and the first sense voltage, an adjustable test current source for generating an adjustable test current, a replicate element coupled with the adjustable test current source for receiving the adjustable test current so as to result in a second voltage drop across the replicate element whereby a voltage at one terminal of the replicate element is compared with a second sense voltage to provide a feedback to adjust the adjustable test current so that the first amplifier output indicates the state of the measurable element.

Claim 28 as amended is distinguishable from Johnson because Johnson does not disclose comparing a voltage at one terminal of the replicate element with a second sense voltage to provide a feedback to adjust the adjustable element. Such comparison is useful in the present invention because without it, the known state of the replicate element cannot be used to determine the state of the measurable element and the first amplifier output would be meaningless. Johnson does not use such a comparison. In Johnson, the current in the replicate circuit is set up by adjusting a resistor 33 (Col. 3, lines 50-51), and not by comparing a voltage in the circuit with a reference voltage. Therefore, claim 28 as amended is patentable over Johnson.

Claim 29 as amended, claim 31 as amended, and claims 46-48 as amended depend from claim 28 as amended and include further limitations in addition to the limitations in claim 28 as amended. Accordingly, claim 29 as amended, claim 31 as amended, and claims 46-48 as amended are patentable for at least the same reasons claim 21 as amended is patentable.

Claim 31 as amended is patentable for the further reasons that Johnson does not disclose a second amplifier configured to generate a second amplifier output dependent on the difference between a second sense voltage and a first input voltage that is dependent on the second voltage drop, and the adjustable test current source receiving the second amplifier output so that level of the adjustable test current is stabilized when the first input voltage equals the second sense voltage. The Examiner combined Johnson with Ozguc in rejecting claim 10, stating that Ozguc discloses the second amplifier 525. The Johnson and Ozguc combination cannot be used to reject claim 31 as amended because there is no teaching or suggestion in either Johnson or Ozguc for the combination. To incorporate the second amplifier 525 of Ozguc into Johnson, one has to remove the oscillator 25 in Johnson and connect the gate of transistor 32 in Johnson to the output of the second amplifier 525 in Ozguc. This will defeat the purpose of using the oscillator to generate a pulsating current through sense resistor 14 in the Johnson apparatus, as the Johnson apparatus is formed to detect variations of the pulsating current through sense resistor 14 (Col. 3, lines 16-18; Col. 4, lines 3-7; Claim 1). Therefore, a prima facie case to combine Johnson and Ozguc in rejecting any of the claims in the present application cannot be established.

Claim 46 as amended is patentable for the further reason that Johnson does not disclose a measurable circuit element being a Zener diode having a trimmed and untrimmed state.

Claim 47 as amended is patentable for the further reason that Johnson does not disclose a replicate circuit element being an untrimmed Zener diode.

Claim 48 as amended is patentable for the further reason that neither Johnson nor Ozguc discloses the first sense voltage being equal to the second sense voltage.

New claim 49 recites:

An apparatus for determining a state of a measurable circuit element having a plurality of states and a different impedance in each state, comprising:

a first circuit including a replicate circuit element having similar characteristics as the measurable circuit element, the first circuit configured to generate a first test current through the replicate circuit element; and

a second circuit coupled with the first circuit and including the measurable circuit element, the second circuit configured to generate a second test current dependent on the first test current through the measurable circuit element to result in a voltage drop across the measurable circuit element, the second circuit further configured to generate a measured current dependent on the voltage drop and to output a voltage dependent on the difference between the measured current and a scaled reference current to indicate the state of the measurable element.

New claim 49 is distinguishable from Johnson because Johnson does not disclose a second circuit configured to generate a measured current dependent on the voltage drop across the measurable circuit element and to output a voltage dependent on the difference between the measured current and a scaled reference current to indicate the state of the measurable element. As discussed above in the argument regarding claim 5, transistor 36 in Johnson cannot be regarded as the dependent measurable current source because transistor 36 in Johnson does not generate a measured current dependent on the voltage drop across the sense resistor 14, which the Examiner regarded as the measurable circuit element. In Johnson, transistor 36 acts as part of a current mirror and the current generated by transistor 36 is a mere multiple of the current through transistor 35, which current is dependent on the variable resistor 33 and not on the sense resistor 14 or the voltage across sense resistor 14 (Col. 3, lines 50-58).

Furthermore, the circuit in Johnson is not configured to generate a voltage to indicate the state of a measurable element wherein the voltage is dependent on the difference between a reference current and a measured current that is dependent on a voltage drop across a measurable circuit element. In Johnson, "(t)he pulsating voltage developed across sense resistor 14 is coupled by way of capacitor 23 and resistor 37 to the inverting input of op-amp 38." (Col. 3, lines 61-64) A detector is configured to respond to variations in the pulsating potential thereby produces an output proportional to the variations in the pulsating current through sense resistor (Claim 1). Thus, in Johnson, the state of the sense resistor 14 is determined by variations in the pulsating current through the sense resistor 14 and not by the difference between a reference current and a measured

current that is dependent on a voltage drop across a measurable circuit element. Therefore, new claim 49 is patentable over Johnson.

New claims 50-59 depend from new claim 49 and include further limitations in addition to the limitations in new claim 49. Accordingly, new claims 50-59 are patentable for at least the same reasons new claims 49 is patentable.

Specifically, regarding new claim 50, Johnson does not disclose an inverter for receiving the voltage output to generate an output of “high” or “low” depending on the state of the measurable circuit element. Since Johnson is mainly concerned with detecting variations in the pulsating current through the sense resistor 14 (Col. 4, lines 3-7; Claim 1), an inverter added to the Johnson circuit would not provide any advantages in detecting the variations.

Regarding new claim 51, Johnson does not disclose a first circuit configured to generate a threshold current depending on a voltage drop across the replicate circuit element and to generate a first reference current whereby the first test current is stabilized at a certain value when the threshold current is equal to the first reference current. As discussed above, the currents through resistors 33 and 34, which the Examiner regarded as the replicate circuit element in rejecting claims 1-9, are adjusted by adjusting the resistor 33 and not by balancing two different currents.

Regarding new claim 52, Johnson does not disclose a first test current source, a first reference current source, and a threshold current source interconnected in the first circuit in a feedback loop such that the first test current is stabilized at a certain value when the threshold current is equal to the first reference current.

Regarding new claim 53, Johnson does not disclose a measured current source and a scaled reference current source wherein the voltage is output from between the two current sources to indicate the state of the measurable circuit element. In Johnson, the pulsating voltage is output from between transistor 36 and sense resistor 14. Transistor 36 cannot be regarded as the measured current source because the current it generates is not dependent on the voltage drop across resistor 14, which the Examiner regarded as the measurable circuit element in the claim. In Johnson, transistor 36 acts as part of a current mirror and the current generated by transistor 36 is a mere multiple of the current through transistor 35,

which current is dependent on the variable resistor 33 and not on the sense resistor 14 or the voltage across the sense resistor 14 (Col. 3, lines 50-58).

In rejecting claim 5 as previously presented, the Examiner has regarded the offset voltage 17 in Johnson as the scaled reference current in the claim. But the offset voltage 17 is not a current source and it does not generate a scaled reference current. In fact, the offset voltage 17 is not even a circuit element. It merely "represents the difference in potential that exists between the gas tank and the dashboard." (Col. 1, lines 37-39) Therefore, the offset voltage 17 in Johnson cannot be analogized with the scaled reference current source in new claim 53, and new claim 53 is distinguishable from Johnson.

Regarding new claim 54, Johnson does not disclose a first test current transistor, a threshold transistor, and a reference transistor. The part of the circuit in Johnson, which is regarded by the Examiner as the replicate circuit, only includes two transistors 32 and 34. Furthermore, transistors 32 and 34 are not interconnected with each other or with other transistors in the Johnson circuit in the manner as recited in new claim 54.

Regarding new claim 55, although Johnson discloses a mirror transistor 35, Johnson does not disclose all of the other transistors in new claim 54, from which claim 55 depends.

Regarding new claim 56, Johnson does not disclose a second test current transistor, a measured threshold transistor, and a scaled reference transistor interconnected with each other in the manner as recited in new claim 56.

Regarding new claim 57, Johnson does not disclose the scaled reference current being scaled from the reference current.

Regarding new claim 58, Johnson does not disclose the scaled reference current being a fraction of the reference current.

Regarding new claim 59, Johnson does not disclose the measurable circuit element being a Zenor diode having a trimmed or untrimmed state to be determined by the apparatus claimed.

New claim 60 recites:

An apparatus for determining a state of a measurable circuit element having a plurality of states and a different impedance in each state, comprising:

a first circuit including a replicate circuit element having similar characteristics as the measurable circuit element, the first circuit configured to generate a first test current through the replicate circuit element, the first test current being stabilized when a voltage at one terminal of the replicate circuit element is equal to a first reference voltage; and

a second circuit coupled with the first circuit and including the measurable circuit element, the second circuit configured to generate a second test current dependent on the first test current through the measurable circuit element and to generate an output depending on the difference between a measured voltage at one terminal of the measurable circuit element and a second reference voltage associated with the first reference voltage, the output indicating the state of the measurable element,

New claim 60 is distinguishable from Johnson or Ozguc. Johnson does not disclose a first circuit configured such that a first test current through a replicate circuit element is stabilized when a voltage at one terminal of the replicate circuit element is equal to a first reference voltage. Ozguc discloses controlling a current through a transistor Xk1 by comparing a voltage V_{INT} with a reference voltage V_{ref_2} using comparator 525. But the current through transistor Xk1 is not a current through capacitor C_{INT} , which the Examiner regarded as analogous to the replicate circuit element in claim 10 as previously presented. Also, in Ozguc, the current through transistor Xk1 is not stabilized but is turned off when V_{INT} reaches V_{ref_2} . Therefore, new claim 60 is distinguishable from either Johnson or Ozguc.

New claims 61-69 depend from new claim 60 and include further limitations in addition to the limitations in new claim 60. Therefore, new claim 61-69 are patentable for at least the same reasons new claims 60 is patentable.

New claims 61-62 are patentable for the further reasons that neither Johnson nor Ozguc discloses a relationship between a first reference voltage and a second reference voltage.

The Examiner is invited to call the undersigned at the number listed below if any matter can be solved by telephone.

Respectfully submitted,

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